UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mineral-resource potential of the Paria Plateau Wilderness Study Area, Coconino County, Arizona

U.S. Bureau of Mines Mineral Land Assessment
MLA 63-82
1982

By
Lane, M.E.

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines editorial standards. Work on this study was conduced by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

UNITED STATES DEPARTMENT OF THE INTERIOR
(BUREAU OF MINES)

MINERAL-RESOURCE POTENTIAL OF THE PARIA PLATEAU WILDERNESS STUDY AREA, COCONINO COUNTY, ARIZONA

By
Michael E. Lane

MLA-63-82
1982

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines editorial standards. Work on this study was conducted by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

STUDIES RELATED TO WILDERNESS
Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Paria Plateau Wilderness Study Area*, Coconino County, Arizona.

*Originally done as the Navajo Application, Arizona, Study Area persuant to an agreement between IFOC-DFO-MLA dated 1/29/80.

CONTENTS

ILLUSTRATIONS

MINERAL-RESOURCE POTENTIAL OF THE PARIA PLATEAU WILDERNESS STUDY AREA, COCONINO COUNTY, ARIZONA

By Michael E. Lane, U.S. Bureau of Mines

INTRODUCTION

The 124,428 acres (50,376 ha) making up the Paria Plateau study area is in Coconino County in northern Arizona (fig. 1). The eastern boundary is southwest of Lake Powell, about 12 air miles (19 km) west of Page, Arizona. The area ranges from the Arizona-Utah state line to a few miles north of Highway 89A. Its southern boundary being Vermilion Cliffs Natural Area, the study area is bordered on the east by Paria Canyon Primitive Area and the north by the primitive area and Utah-Arizona state line (pl. 1). Sloping gently northward, the plateau is severed by Kaibab (Buckskin) Gulch and Paria Canyon.

Little vegetation other than juniper characterizes the area. Temperatures reach in excess of 100° F in summer and drop to subfreezing in winter months. Precipitation is minimal during most months.

Most mining activity has been for uranium in the Chinle Formation along Vermilion Cliffs, adjacent to the study area. The largest of the few mines in the area is the Sun Valley Mine located southwest of Cliff Dwellers Lodge (pl. 1). A few scattered prospects are in Paria Canyon, in the northern portion of House Rock Valley, and adjacent to Highway 89A. The only known current activity is some sporadic exploration at the Sun Valley Mine, about 2 miles (3.2 km) south of the study area.

In addition to the uranium activity, prospecting and mineral-resource investigations were conducted for gold and mercury occurrences in a mudstone

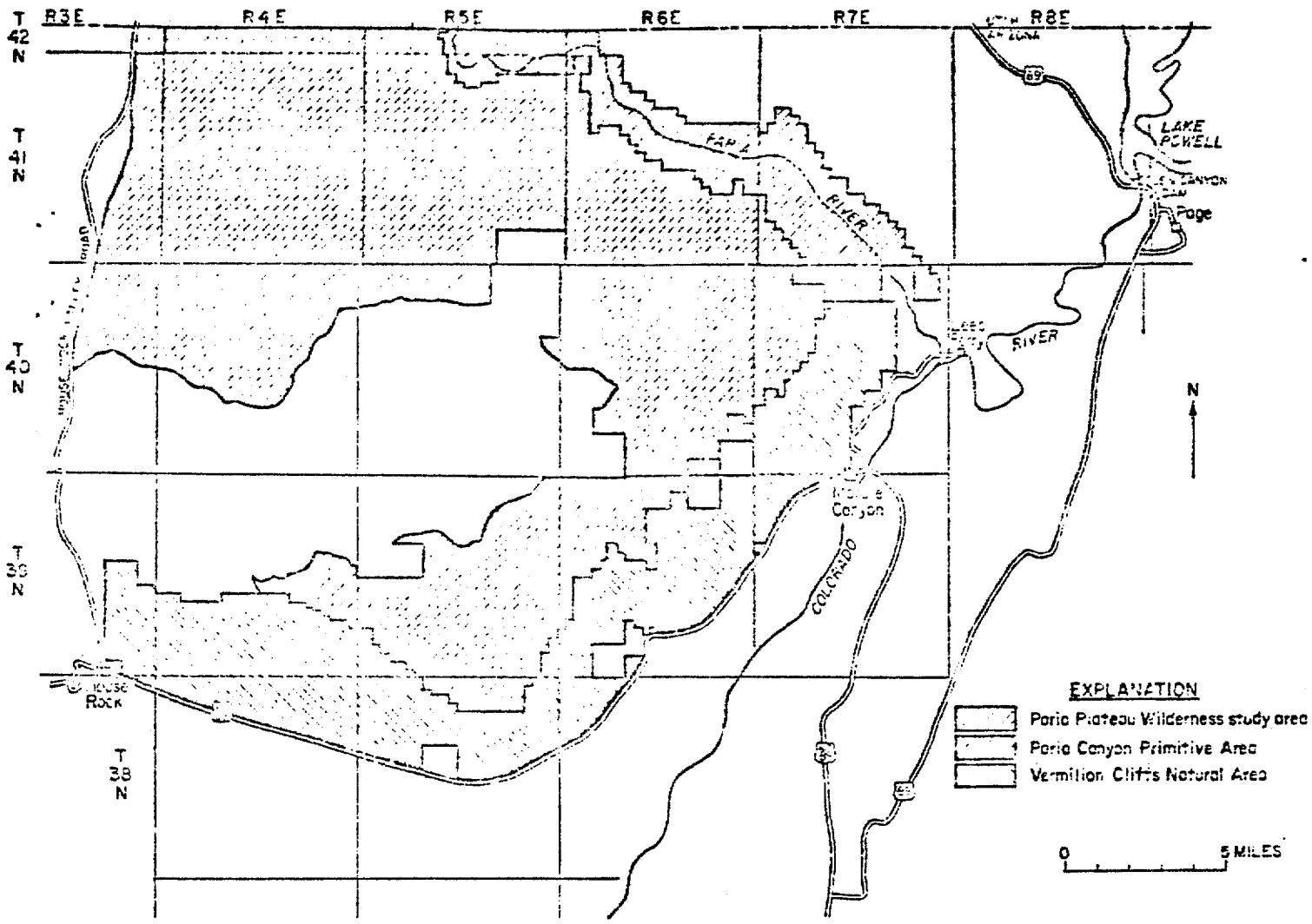


Figure 1.--Paria Plateau Wilderness Study Area

unit of the Chinle Formation (Phoenix, 1963). These investigations suggested that gold and possibly mercury occur in minute, but widespread quantities in the Paria Canyon-Lees Ferry area.

No economically viable occurrences of gold or mercury were detected in this investigation.

MINING DISTRICTS AND MINERALIZED AREAS

Mining Districts and Claims

No formal mining district is recognized in the study area. Mineral-resource literature and courthouse records of mining claims refer frequently to Paria Canyon, Vermilion Cliffs, and Lees Ferry.

Many claims were once located near the area on outcrops of the Chinle Formation in House Rock Valley, Vermilion Cliffs, and for about 10 mi (16 km) up Paria Canyon from Lees Ferry.

Past and Present Mining Activity and Production

El Pequito Mine

The El Pequito mine is about 2 miles (3.2 km) west of Lees Ferry in the NW 1/4 sec. 14, T. 40 N., R. 7 E., (pl. 1, samples 3-16), on the eastern edge of the study area at the base of the Vermilion Cliffs.

The mine lies in the Shinarump Conglomerate along the contact with the underlying Moenkopi Formation. Mineralization occurs in a stream channel in the Shinarump which is composed of poorly sorted conglomerate interbedded with sandstone, siltstone, and mudstone with local carbonaceous wood fragments. Pebbles and sand grains in the channel are coated with ore minerals which locally impregnate mudstone. The channel is most likely an offshoot of a larger channel. The Moenkopi is bleached adjacent to the Shinarump contact (Phoenix, 1963).

Phoenix also reports the occurrence of pyrite, chalcopyrite and uraninite in calcite veinlets. During the field investigation no pyrite or chalcopyrite was seen.

Sam Prospect

The Sam prospect is a 27-foot (8.2-m) adit in SE 1/4 sec. 2, T. 39 N., R. 6 E., (pl. 1, samples 17-18), about 2 miles (3.2 km) northwest of Cliff Dwellers Lodge on the southside of Badger Canyon.

The adit is in the Petrified Forest member of the Chinle formation, a gray-to-purple unit which weathers to slopes and rounded knobs. The rock is interbedded siltstone and mudstones. Two samples were taken: one sample, a 2.5-ft (0.76-m) chip, contained 0.337 percent U_3O_8, 0.14 percent vanadium, and 5.6 parts per million (ppm) mercury; the other sample, a 5.0-ft (1.5-m) chip, contained 0.026 percent U_3O_8 and 0.007 percent vanadium.

Jasper Mine

The Jasper (Maggie) mine, a 40-foot (12.2-m) adit, is in the SW 1/4 sec. 27, T. 39 N., R. 6 E., (pl. 1, samples 19-23), about 300 feet (91 m) north of U.S. 89A about 1/4 mile (0.4 km) east of Cliff Dwellers Lodge.

The adit was driven N. 6° E. in poorly sorted Shinarump conglomerate composed of rounded quartzite pebbles and quartz sand. Siltstone is interbedded with mudstone on the walls near the floor. Minor copper staining is evident at the Moenkopi-Shinarump contact. The mudstone and siltstone comprises the lower 29 inches (74 cm) of the wall, and conglomerate the upper 36 inches (91 cm). Sample 19, taken in the mudstone and siltstone, contained 0.018 percent U_3O_8, and sample 20, taken directly above in the conglomerate, contained no U_3O_8. Two samples were taken 10 feet (3.1 m) from the portal on the east wall. Sample 21, taken above the siltstone in the lower portion of the wall in indurated conglomerate, contained 0.019 percent U_3O_8.

Sample 22, taken above sample 21, in poorly consolidated conglomerate, contained 0.135 percent U_3O_8. The conglomerate was composed of poorly sorted quartz and quartzite pebbles, small siltstone lenses, and minor copper staining. Sample 23, taken outside the adit, adjacent to the portal, in the Moenkopi just below the contact, assayed 0.085 percent U_3O_8.

Sun Valley Mine

The Sun Valley uranium mine is approximately 3 miles (4.8 km) southwest of Cliff Dwellers Lodge and about 1 mile (1.6 km) north of U.S. Highway 89A, (pl. 1, samples 24-47). The mine lies near the southeastern boundary in the southernmost portion of the study area.

At the time of this study, the mine was owned and operated by Intermountain Exploration Co. The immediate area is covered by unpatented claims. Some claims are near Soap Creek (McGregor, 1977).

The mine was started in 1954 during a period of intense uranium exploration in the area. An inclined shaft was sunk on a Shinarump outcrop to develop a small ore deposit. Several hundred tons of uranium ore averaging 0.28 percent U_3O_8 was shipped before the shaft was filled with mud from a flash flood. Later, a vertical shaft was sunk but there was no further production (Wyman, 1970). A drift driven off the shaft connected with the old, sand-filled workings.

The mine is situated on the Shinarump-Moenkopi contact where uranium occurs in a U-shaped Shinarump stream channel. Mineralization is irregular; the highest U_3O_8 content is 0.216 percent (sample 41) located in the old workings (pl. 1).

Four samples contained between 2 and 26 ppm rhenium, quantities not considered economically significant under present conditions.

Intermountain Exploration Company has done some drilling to determine possible extent of mineralization. According to company files, drilling has produced values as high as 1.6 percent U_3O_8 in one hole; several holes have more than 0.2 percent.

A potential orebody exists in the Sun Valley mine area, but with extant data its relationship to the study area cannot be determined.

Red Wing Prospect

The Red Wing prospect consists of two adits, 43 feet (13 m) and 55 feet (17 m) long, in sec. 3, T. 40 N., R. 7 E., (pl. 1, samples 72-76). The prospect is in Paria Canyon about 4 miles (6.4 km) upstream from Lees Ferry. The adits were driven in the lower Shinarump and upper Moenkopi along the contact. The Shinarump is trashy stream channel material composed of sandstone, siltstone and carbonaceous material. The Moenkopi at this location is typical maroon-colored siltstone with bleached areas.

Geiger-counter readings were very irregular.

ASSESSMENT OF MINERAL-RESOURCE POTENTIAL

The Paria Plateau study area has low potential for uranium. Occurring in the Chinle Formation, isolated uranium deposits are scattered along Vermilion Cliffs. It is possible that these type deposits could underlie Paria Plateau. However, they would be at considerable depth and would be difficult to locate.

Samples from several of the investigated areas contained significant amounts of U_3O_8. Mineral occurrence is irregular and usually in the lower Shinarump adjacent to the Moenkopi, as indicated by sample assays.

Gold-mercury potential is low. A large part of the Chinle Formation is gold-bearing but the grade is very low and would be at great depths. (Bush and Lane, 1980)

Oil and gas potential is hard to determine. According to Bush and Lane (1980), deeply-buried stratigraphic traps in low pressure provinces would be the most likely possibility for deposits. The potential is considered low.

REFERENCES CITED

Bush, A. L., and Lane, M. E., 1980, Preliminary report on the mineral-resource potential of the Vermilion Cliffs-Paria Canyon Instant Study Area, Coconino County, Arizona, and Kane County, Utah: U.S. Geological Survey Open-File Report 80-1056, 27 p.

McGregor, D. R., 1977, unpublished report, Intermountain Exploration Company files.

Phoenix, D. A., 1963, Geology of the Lees Ferry area, Coconino County, Arizona: U.S. Geological Survey Bulletin 1137, 86 p.

Wyman, R. V., 1970, unpublished report, Intermountain Exploration Company files.

BIBLIOGRAPHY

Bush, A. L., and Lane, M. E. , 1981, Analyses of rock, stream-sediment, and water samples from the Vermilion Cliffs-Paria Canyon Instant Study Area, Coconino County, Arizona, and Kane County, Utah: U.S. Geological Survey Open-File Report 81-391, 35 p.

Haynes, D. D., and Hackman, R. J., 1978, Geology, structure and uranium deposits of the Marble Canyon 1° x 2° quadrangle, Arizona: U.S. Geological Survey Miscellaneous Investigations Map I-1003.

Petersen, R. G., 1959, Preliminary geologic map of the Emmett Wash NE quadrangle, Coconino County, Arizona: U.S. Geological Survey Mineral Investigations Field Studies Map MF-215.

_____1960, Detrital-appearing uraninite grains in the Shinarump Member of the Chinle Formation in northern Arizona: Economic Geology, v. 55 no. 1, p. 138-149.

Petersen, R. G., and Wells, J. D., 1961, Preliminary geologic map of the Emmett Wash NW quadrangle, Coconino County, Arizona: U.S. Geological Survey Mineral Investigations Field Studies Map MF-197.

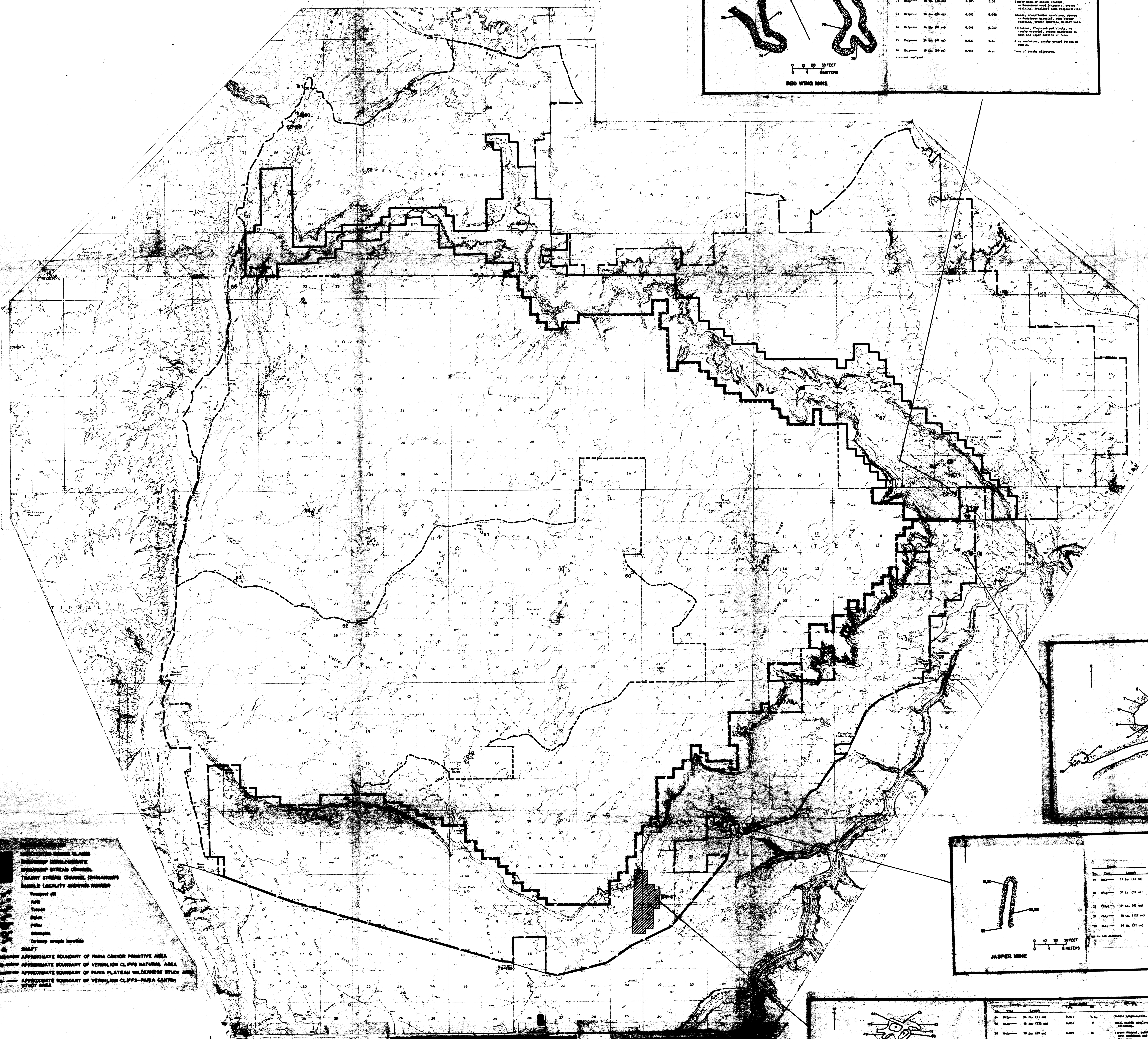
UNITED STATES DEPARTMENT OF INTERIOR

BUREAU OF MINES

OPEN FILE REPORT

63-82

PLATE 1



[illegible]

PATENTED MINING CLAIMS

SHINARUMP CONGLOMERATE

SHINARUMP STREAM CHANNEL

TRASHY STREAM CHANNEL (SHINARUMP)

SAMPLE LOCALITY SHOWING NUMBER

Prospect pit

Adit

Trench

Raise

Pillar

Stockpile

Outcrop sample location

SHAFT

APPROXIMATE BOUNDARY OF PARIA CANYON PRIMITIVE AREA

APPROXIMATE BOUNDARY OF VERMILION CLIFFS NATURAL AREA

APPROXIMATE BOUNDARY OF PARIA PLATEAU WILDERNESS STUDY AREA

APPROXIMATE BOUNDARY OF VERMILION CLIFFS–PARIA CANYON STUDY AREA

Base from U.S. Geological Survey Emmett Wash, 1954; House Rock Springs, 1953; Jacob Lake, 1936-53; Lees Ferry, 1954; Nipple Butte, 1953; Paria Plateau, 1954; Paria, 1954; Tanner Wash, 1954; Telegraph Flat, 1954

[redacted]

Sampling and surveying done by [illegible] with assistance from Russ McKallon, [illegible] and Tom Biggs.

MINES AND PROSPECTS MAP OF THE PARIA PLATEAU WILDERNESS STUDY AREA

COCONINO COUNTY, ARIZONA

BY MICHAEL E. LANE, U. S. BUREAU OF MINES

1982

RED WING MINE

Sample No.	Type	Length	Assay data (in percent) U_3O_8	Cu	Remarks
72	Chip—	18 in. (46 cm)	0.185	0.35	Trashy zone of stream channel, carbonaceous wood fragments, copper staining, localized high radioactivity.
73	Chip—	30 in. (76 cm)	0.005	0.038	Coarse, cross-bedded sandstone, sparse carbonaceous material, some copper staining, trashy material on west wall.
74	Chip—	24 in. (61 cm)	0.006	0.013	Siltstone, fractured and blocky, no trashy material, coarse sandstone in back and upper portion of face.
75	Chip—	24 in. (61 cm)	0.030	n.a.	Gray sandstone, trashy toward bottom of sample.
76	Chip—	18 in. (46 cm)	0.018	n.a.	Lens of trashy siltstone.

n.a.—not analyzed.

Table 1.—Mineral Deposits of the Paria Plateau Wilderness Study Area

[Sample No. corresponds with sample locality shown on map. Prospects or mines labeled inactive have had no exploration or development work since 1975. Hg, mercury; U, uranium; Cu, copper; *, see table 2]

Map No.	Name	Location	Resource(s)	Type deposit	Development category	Brief description	Reference
1-2	None	NW 1/4 sec. 18, T. 40 N., R. 8 E., (Arizona)	Hg	Sedimentary	Prospect, inactive.	Originally thought to have mercury in siltstone and mudstone of Chinle Formation, no evidence of mercury from sampling.	Phoenix, 1963.
3-14	El Pequito Mine.	NW 1/4 sec. 14, T. 40 N., R. 7 E., (Arizona)	U	Stream channel.	Mine, inactive.	Trashy stream channel in lower Shinarump, mixed siltstone, sandstone, carbonaceous wood, some copper staining.	Do.
17-18	Sun Prospect.	SE 1/4 sec. 2, T. 39 N., R. 6 E., (Arizona)	U	Sedimentary	Mine, inactive.	Moderate to weak uranium concentrations in interfingered siltstone and mudstone in the Chinle Formation.	Do.
19-23	Jasper Mine.	SW 1/4 sec. 27, T. 39 N., R. 6 E., (Arizona)	U, Cu	Stream channel.	Mine, inactive.	Low uranium concentrations in conglomerate and alternating conglomerate and siltstone in the lower Shinarump.	Do.
24-47	Sun Valley Mine.	SW 1/4 sec. 6, T. 38 N., R. 6 E., (Arizona)	U	Stream channel.	Mine, inactive.	Uranium mineralization in a stream channel in thin base of the Shinarump Conglomerate, stream channel is horseshoe-shaped in mine vicinity and higher concentrations of uranium occur as there is greater ground cover, uranium minerals are uraninite and carnotite with association of [illegible].	McGregor, 1977.
48-54	None	T. 40 N., R. 4 E., R. 5 E., T. 39 N., R. 4 E., R. 5 E.	None	None	Outcrop	Random Navajo Sandstone outcrop samples on Paria Plateau, fine-grained sandstone, cross-bedded, no visible mineralization.	None.
55	None	SW 1/4 sec. 36, T. 42 N., R. 3 E., (Arizona)	Gypsum	Evaporite	Outcrop	Moenkopi Formation, thinly bedded siltstone with gypsum filled fractures, occurring as thin layers up to a few inches thick.	None.
56-58	None	SW 1/4 sec. 14, T. 43 S., R. 2 W., (Utah)	Cu	Secondary staining.	Mine, inactive.	Alternating beds of siltstone and sandstone with minor copper staining at caved adit, host rock is light gray to buff color.	None.
59-60	None	SW 1/4 sec. 14, T. 43 S., R. 2 W., (Utah)	None	None	Mine, inactive.	Alternating yellow sandstone beds with dark brown siltstone, no visible mineralization.	None.
61	None	SW 1/4 sec. 11, T. 43 S., R. 2 W., (Utah)	None	None	Prospect, inactive.	Iron stained fractures in Chinle Formation, buff colored sandstone and siltstone.	None.
[illegible]	None	[illegible] (Utah)	None	None	Outcrop	Random [illegible] Navajo [illegible] color, well sorted, fine [illegible]	[illegible]
64	None	NE 1/4 sec. 15, T. 40 S., R. 1 W., (Utah)	None	None	Outcrop	White Navajo Sandstone, fine-grained, cross-bedded.	None.
65	None	SE 1/4 sec. 4, T. 43 S., R. 1 W., (Utah)	None	None	Outcrop	Carmel Formation, siltstone, bleached in places.	None.
66	None	SE 1/4 sec. 14, (unsurveyed) T. 41 N., R. 4 E., (Arizona)	None	None	Outcrop	Chinle outcrop, siltstone, purple and light gray color.	None.
67	None	SW 1/4 sec. 20, T. 41 N., R. 7 E., (Arizona)	None	None	Prospect, inactive.	Sandstone talus slope, most likely Navajo Sandstone.	None.
68	None	SW 1/4 sec. 34, T. 41 N., R. 7 E., (Arizona)	Cu, U	Stream channel.	Mine, inactive.	Copper showing in sandstone member of Chinle Formation, very weak copper content.	None.
69	Lehneer	SW 1/4 sec. 34, T. 41 N., R. 7 E., (Arizona)	U, Ag	Sedimentary	Prospect, inactive.	Gray siltstone of Chinle Formation that contained very weak concentrations of uranium and silver.	Phoenix, 1963.
70-71	Lehneer	SW 1/4 sec. 34, T. 41 N., R. 7 E., (Arizona)	U	Stream channel.	Prospect, inactive.	Light siltstone lens in massive sandstone containing carbonaceous wood fragments, lens is about 12 feet long and 5 to 6 inches thick.	Do.
72-76	Redwing	NE 1/4 sec. 3, T. 40 N., R. 7 E., (Arizona)	U, Cu	Stream channel.	Mine, inactive.	Trashy stream channel, carbonaceous wood fragments, copper staining, some massive sandstone with siltstone, Moenkopi crops out irregularly.	Do.
77-78	Bear	SW 1/4 sec. 2, T. 40 N., R. 7 E., (Arizona)	U	Stream channel.	Mine, inactive.	Maroon and gray mottled mudstone, back is bottom of stream channel, some thinly layered siltstone over sandstone, some carbonaceous wood fragments.	Do.
79-90	Universal	SW 1/4 sec. 16, T. 39 N., R. 5 E., (Arizona)	U	Stream channel.	Prospect, inactive.	Stream channel, predominantly sandstone with conglomerate and siltstone intermixed, Moenkopi contact visible, deposit small in size.	Do.

REFERENCES

McGregor, D. R., 1977, unpublished report, Intermountain Exploration Company files.

Phoenix, D. A., 1963, Geology of the Lees Ferry area, Coconino County, Arizona: U.S. Geological Survey Bulletin 1137, 86 p.

Table 2.—Information and analysis of samples not shown in mine figures

Sample No.	Type	Length	Assay data* U_3O_8	Cu	V	V_2O_5	Hg	Au	Remarks
1	Grab—	Random	.034	n.a.	0.010	n.a.	<2	n.a.	Petrified Forest Member of Chinle, highly weathered siltstone with interbedded sandstone.
2	Chip—	6 ft (1.8 m)	.011	n.a.	.009	n.a.	<2	n.a.	Do.
16	Chip—	54 in. (137 cm)	.061	.009	.060	n.a.	<2	<2	Conglomerate (Shinarump) mixed with sandstone, some iron staining, small amounts gypsum.
17	Chip—	30 in. (76 cm)	.337	n.a.	.014	n.a.	3.6	<2	Interbedded mudstone and siltstone conglomerate, alternating maroon and buff color.
18	Chip—	60 in. (152 cm)	.026	n.a.	.007	n.a.	<2	n.a.	Complexly interbedded maroon siltstone and mudstone with minor buff mudstone and siltstone.
48	Chip—	28 in. (71 cm)	.001	n.a.	<.003	n.a.	n.a.	<2	Navajo Sandstone outcrop, buff to rust color, concretions present.
49	Chip—	Random	.002	n.a.	<.003	n.a.	n.a.	<2	Red Navajo Sandstone outcrop, weathered, cross-bedding.
50	Chip—	20 in. (51 cm)	n.d.	n.a.	<.003	n.a.	n.a.	<2	White Navajo Sandstone, weathered into knobs.
51	Chip—	24 in. (61 cm)	.004	n.a.	<.003	n.a.	n.a.	n.a.	Light buff to white Navajo Sandstone, contains small iron-stained blebs.
52	Chip—	Random	.003	n.a.	<.003	n.a.	n.a.	n.a.	Navajo Sandstone, red color.
53	Chip—	24 in. (61 cm)	.002	n.a.	<.003	n.a.	n.a.	n.a.	Red, cross-bedded, Navajo Sandstone.
54	Chip—	18 in. (46 cm)	n.d.	n.a.	<.003	n.a.	n.a.	n.a.	Red, cross-bedded, Navajo Sandstone.
55	Chip—	24 in. (61 cm)	.008	n.a.	.004	n.a.	n.a.	<2	Moenkopi(?), thinly bedded siltstone with gypsum filling fractures, bedding planes about 1/8 in. thick.
56	Grab—	Random	n.d.	.35	<.003	n.a.	n.a.	n.a.	Copper staining in white to light gray sandstone.
57	Chip—	18 in. (46 cm)	.015	n.a.	.004	n.a.	n.a.	n.a.	Shear zone in siltstone, abundant slicks, highly fractured, no visible mineralization.
58	Chip—	18 in. (46 cm)	.003	n.a.	<.003	n.a.	n.a.	<2	Fracture zone in alternating siltstone and sandstone beds, slicks present.
59	Chip—	24 in. (61 cm)	.006	n.a.	<.003	n.a.	n.a.	n.a.	Alternating light yellow to buff and dark brown beds of siltstone, no visible mineralization.
60	Grab—	Random	.006	n.a.	<.003	n.a.	n.a.	n.a.	Dump sample of sample 59 locality.
61	Chip—	24 in. (61 cm)	.009	n.a.	.004	n.a.	n.a.	n.a.	Chinle Fm., siltstone, limonite staining [illegible]
[illegible]	Chip—	24 in. (61 cm)	n.d.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Random	.004	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Chip—	Random	[illegible]	[illegible]	[illegible]	[illegible]	n.a.	<2	[illegible]
66	Chip—	Random	.060	n.a.	.059	n.a.	<2	n.a.	Outcrop of maroon and gray colored Chinle siltstone.
67	Grab—	Random	.015	n.a.	.007	n.a.	<2	n.a.	Sandstone blocks and sand from upper cliffs, not known which formation.
68	Chip—	17 in. (43 cm)	.006	n.a.	.011	n.a.	<2	n.a.	Dark bend in sandstone, small amounts copper staining in dump, limonite.
69	Grab—	Random	.006	36 ppm	n.a.	n.a.	<2	n.a.	Chinle outcrop, siltstone.
70	Chip—	6 in. (15 cm)	.006	.092	n.a.	n.a.	n.a.	n.a.	Siltstone-mudstone lens in massive sandstone, chocolate colored, minor copper staining.
71	Chip—	5 in. (12 cm)	.689	.45	n.a.	n.a.	n.a.	n.a.	Organic material in siltstone lens from sample locality.
77	Chip—	36 in. (91 cm)	.002	n.a.	n.a.	n.a.	n.a.	n.a.	Maroon and gray spotted mudstone, back is bottom of stream channel composed of mudstone matrix with sandstone boulders.
78	Chip—	18 in. (45 cm)	.033	n.a.	n.a.	n.a.	n.a.	n.a.	Thinly layered siltstone overlying massive sandstone, some organic matter.
79	Chip—	54 in. (137 cm)	0.002	n.a.	n.a.	0.02	n.a.	n.a.	Shinarump-Moenkopi contact, medium to coarse-grained sandstone with lens of rounded quartz pebble conglomerate, shale.
80	Chip—	43 in. (109 cm)	<0.002	n.a.	n.a.	0.01	n.a.	n.a.	Poorly sorted stream channel with siltstone fragments and sandstone lenses.
81	Chip—	32 in. (81 cm)	0.008	n.a.	n.a.	0.02	n.a.	n.a.	Gray, bleached Moenkopi, varied bedding thicknesses, some carbonaceous material.
82	Chip—	26 in. (66 cm)	0.004	n.a.	n.a.	0.01	n.a.	n.a.	Stream channel, poorly sorted, limonite and gypsum.
83	Chip—	29 in. (74 cm)	0.015	n.a.	n.a.	0.02	n.a.	n.a.	Bleached siltstone, some gypsum crystals.
84	Chip—	33 in. (84 cm)	0.030	n.a.	n.a.	0.02	n.a.	n.a.	Siltstone, bleached, small amounts copper staining.
85	Grab—	Random	0.024	n.a.	n.a.	0.01	n.a.	n.a.	Bottom of trench, hard, well consolidated, orange color, poorly sorted.
86	Chip—	46 in. (117 cm)	<0.001	n.a.	n.a.	0.01	n.a.	n.a.	Alternating conglomerate and sandstone, lower conglomerate unit contains siltstone fragments.
87	Chip—	31 in. (79 cm)	0.002	n.a.	n.a.	0.01	n.a.	n.a.	Weathered, poorly consolidated stream channel, iron staining, quartz pebbles up to 1 in. diameter.
88	Grab—	Random	0.007	n.a.	n.a.	0.01	n.a.	n.a.	Dump material, stream channel composed of quartzite pebbles and cobbles in sandy matrix.
89	Grab—	Random	0.077	n.a.	n.a.	0.03	n.a.	n.a.	Muck is bottom of trench, mostly Moenkopi.
90	Grab—	Random	0.006	n.a.	n.a.	<0.01	n.a.	n.a.	Dump material, stream channel material, quartzite pebbles and cobbles in sandy matrix.

*U_3O_8, Cu, V, V_2O_5, in percent; Hg and Au in parts per million; n.a.—not analyzed; n.d.—not detected.

Table 3. — Fire Assay (oz/ton) for gold and silver of selected samples

[n.d.- not detected]

Sample Number

Element	1	2	3	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	37	38	[illegible]	[illegible]	[illegible]	42	44	46	66	67	68	69
Au	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	[illegible]	[illegible]	[illegible]	[illegible]	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Ag	0.1	n.d.	0.2	n.d.	0.1	n.d.	0.2	0.2	0.1	n.d.	0.1	0.1	0.2	n.d.	n.d.	0.2	n.d.	n.d.	0.1	0.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.1	0.1	n.d.	0.1	n.d.	n.d.	0.2

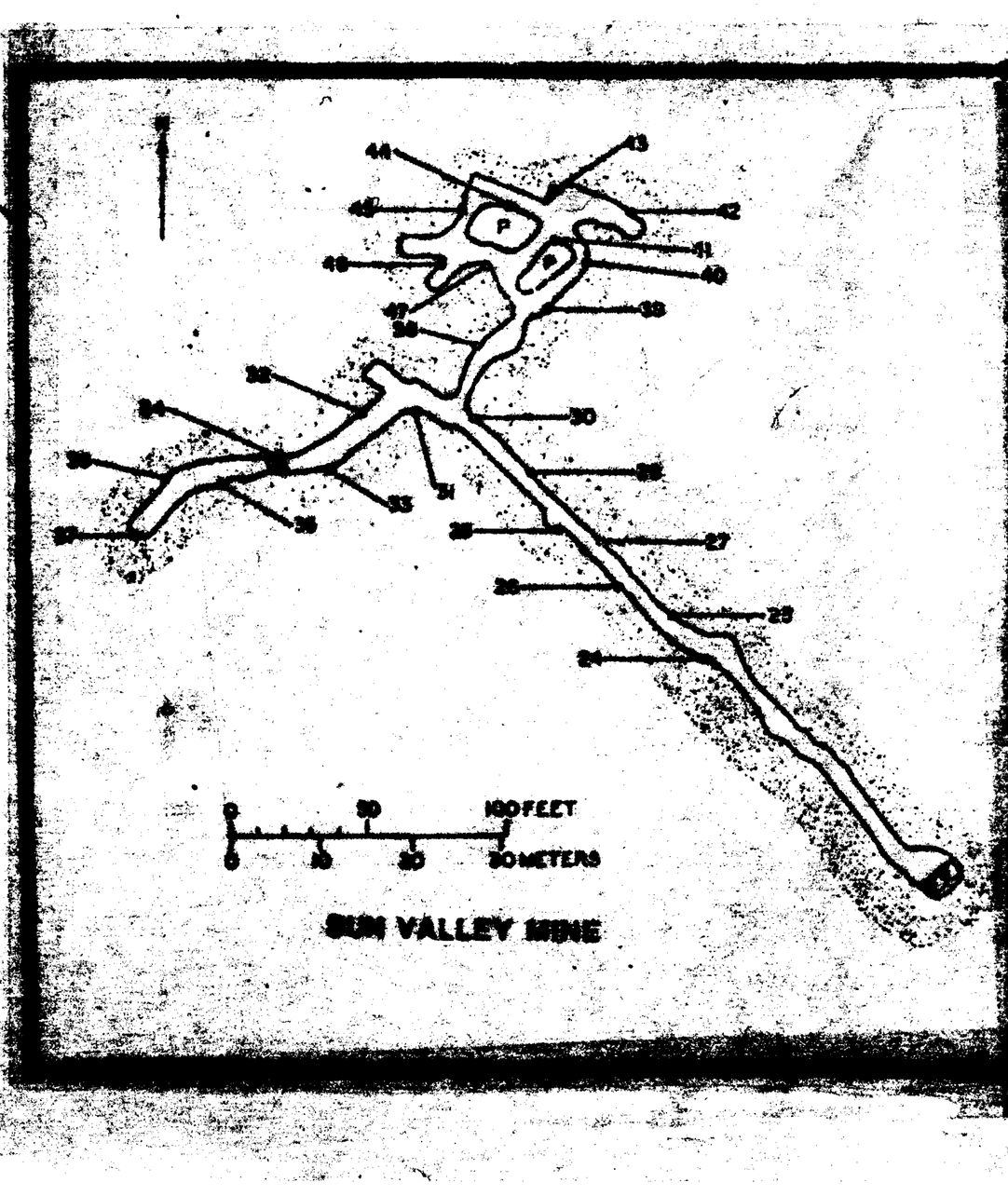
Sample No.	Type	Length	Assay data* U_3O_8	Cu	Remarks
3	Chip—	52 in. (132 cm)	0.110	1.9	Interbedded siltstone and shale stream channel, copper staining.
4	Chip—	24 in. (61 cm)	0.128	n.a.	Trashy stream channel, mixed siltstone, sandstone, carbonaceous wood fragments.
5	Chip—	30 in. (76 cm)	0.091	n.a.	Trashy stream channel, copper staining, sandstone, some organic matter.
6	Chip—	36 in. (91 cm)	0.149	n.a.	Sandstone layered with organic matter, traces gypsum, copper staining, back is small pebble conglomerate.
7	Chip—	36 in. (91 cm)	0.009	n.a.	Alternating sandstone and conglomerate bands, poorly sorted, little carbonaceous wood fragments, no siltstone.
8	Chip—	54 in. (137 cm)	0.071	1.73	Mixed sandstone and conglomerate, stream channel, copper staining.
9	Chip—	18 in. (46 cm)	n.d.	0.385	Interbedded siltstone, sandstone, and shale, carbonaceous wood particles.
10	Chip—	40 in. (102 cm)	0.024	0.024	Massive interbedded sandstone and conglomerate with carbonaceous wood fragments.
11	Chip—	23 in. (58 cm)	0.057	0.124	Interbedded shales and siltstone with minor sandstone and conglomerate, carbonaceous wood fragments.
12	Chip—	48 in. (122 cm)	0.008	91 ppm	Interbedded sandstone and conglomerate with minor siltstone and carbonaceous wood fragments.
13	Chip—	48 in. (122 cm)	0.082	0.130	Trashy stream channel, siltstone, sandstone, conglomerate, carbonaceous wood fragments.
14	Grab—	Random	0.013	0.282	Dump material, fragments up to 6 in. in diameter, mostly siltstone.
15	Grab—	Random	0.028	0.79	Dump material, mostly sandstone and conglomerate.

n.a.—not analyzed; n.d.—not detected.
[illegible]

JASPER MINE

Sample No.	Type	Length	Assay data (in percent) U_3O_8	Cu	Remarks
19	Chip—	29 in. (74 cm)	0.018	1.96	Conglomerate, siltstone and mudstone, minor copper staining, Moenkopi-Shinarump contact.
20	Chip—	36 in. (91 cm)	n.d.	0.065	Conglomerate, mostly quartzite pebbles with coarse sand matrix, poorly sorted, lower Shinarump.
21	Chip—	24 in. (61 cm)	0.019	0.415	Conglomerate, poorly sorted, copper staining, Shinarump.
22	Chip—	48 in. (122 cm)	0.1[illegible]	0.953	Unconsolidated conglomerate, poorly sorted, copper staining, Shinarump.
23	Chip—	32 in. (81 cm)	0.009	0.425	Moenkopi-Shinarump contact, sample taken in Moenkopi, buff siltstone.

n.d.—not detected.



Sample No.	Type	Length	Assay data* U_3O_8	Hg	Remarks
24	Chip—	24 in. (61 cm)	0.011	n.a.	Pebble conglomerate.
25	Chip—	48 in. (122 cm)	0.014	2	Small pebble conglomerate, lower Shinarump.
26	Chip—	39 in. (89 cm)	0.028	26	Stream channel, pebble conglomerate with sandstone and siltstone boulders, Shinarump.
27	Chip—	36 in. (91 cm)	0.144	28	Poorly sorted stream channel, sand to boulder size, Shinarump.
28	Chip—	16 in. (41 cm)	0.054	6	Shinarump stream channel, pebbles up to 1 in. diameter, abundant shale.
29	Chip—	25 in. (64 cm)	0.024	<2	Pebble to cobble conglomerate, poorly sorted, Shinarump.
30	Chip—	36 in. (91 cm)	0.023	n.a.	Shinarump stream channel, pebble conglomerate.
31	Chip—	38 in. (97 cm)	0.014	<2	Stream channel composed mostly of rounded pebbles, some larger siltstone fragments.
32	Chip—	42 in. (107 cm)	0.125	n.a.	Polymictic conglomerate, Shinarump, poorly sorted, shale and siltstone boulders.
33	Chip—	26 in. (66 cm)	0.021	n.a.	Coarse sandstone with 1 in. band pebble conglomerate, lower Shinarump.
34	Grab—	Random	0.016	n.a.	Muck pile from raise round, mostly Shinarump conglomerate, poorly sorted, siltstone and sandstone boulders.
35	Chip—	16 in. (41 cm)	0.028	<2	Pebble conglomerate in stream channel, yellow staining, Lower Shinarump.
36	Chip—	8 in. (20 cm)	0.002	n.a.	Dark brown mudstone and siltstone, no visible mineralization, local Shinarump, upper Moenkopi (?).
37	Chip—	22 in. (56 cm)	0.014	n.a.	Sandstone and siltstone, most likely end of Shinarump channel, upper Moenkopi.
38	Chip—	30 in. (76 cm)	0.006	n.a.	Stream channel, small-pebble conglomerate, sandy matrix, Shinarump.
39	Chip—	60 in. (152 cm)	0.032	<2	Poorly sorted conglomerate, polymictic, sandstone and siltstone clasts, Shinarump.
40	Chip—	36 in. (91 cm)	0.023	n.a.	Light gray, pebble conglomerate, coarsely sorted, sandstone [illegible]
41	Chip—	51 in. (130 cm)	0.[illegible]	42	Interbedded siltstone, sandstone, conglomerate, mudstone, sample taken in siltstone, mudstone and sandstone.
42	Chip—	24 in. (61 cm)	0.[illegible]	<2	Gray coarse sandstone with rounded quartzite pebbles, [illegible] siltstone, Shinarump - Moenkopi contact (?).
43	Chip—	24 in. (61 cm)	0.007	n.a.	Stream channel, interbedded sandstone and pebble conglomerate, yellow staining, Shinarump.
44	Chip—	46 in. (117 cm)	0.[illegible]	n.a.	Well-rounded quartz pebbles in black matrix, contains large fragments of siltstone and mudstone.
45	Chip—	42 in. (107 cm)	0.[illegible]	<2	Rounded pebble conglomerate, sandstone matrix, yellow staining, Shinarump.
46	Chip—	60 in. (152 cm)	0.[illegible]	n.a.	Graded conglomerate, shale clasts, large sandstone and siltstone boulders in back, stream channel.
47	Chip—	36 in. (91 cm)	0.016	12	Rounded pebble conglomerate with some siltstone boulders, Shinarump stream channel.

n.a.—not analyzed.
[illegible]